



## PATENT COOPERATION TREATY

## PCT

## INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

|   |   |  |
|---|---|--|
| Applicant's or agent's file reference<br><b>A31446A</b>   | <b>FOR FURTHER ACTION</b> See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416) |  |
| International application No.<br><b>PCT/JP2003/011048</b>   | International filing date (day/month/year)<br><b>29 August 2003 (29.08.2003)</b>  | Priority date (day/month/year)<br><b>30 August 2002 (30.08.2002)</b> |
| International Patent Classification (IPC) or national classification and IPC<br><b>A61L 27/14, 27/50, 17/00, 31/04, C08J 7/00</b> |   |  |
| Applicant<br><b>RIKEN</b>   |   |  |

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 6 sheets, including this cover sheet.

This report is also accompanied by ANNEXES, i.e., sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of \_\_\_\_\_ sheets.

3. This report contains indications relating to the following items:

|  |   |
|--|---|
| I <input checked="" type="checkbox"/>    | Basis of the report   |
| II <input type="checkbox"/>              | Priority  |
| III <input type="checkbox"/>             | Non-establishment of opinion with regard to novelty, inventive step and industrial applicability  |
| IV <input type="checkbox"/>              | Lack of unity of invention  |
| V <input checked="" type="checkbox"/>    | Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement |
| VI <input checked="" type="checkbox"/>   | Certain documents cited   |
| VII <input type="checkbox"/>             | Certain defects in the international application  |
| VIII <input checked="" type="checkbox"/> | Certain observations on the international application   |

|  |   |
|--|---|
| Date of submission of the demand<br><b>29 August 2003 (29.08.2003)</b> | Date of completion of this report<br><b>17 August 2004 (17.08.2004)</b> |
| Name and mailing address of the IPEA/JP                                | Authorized officer  |
| Facsimile No.  | Telephone No.   |

## INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.

PCT/JP2003/011048

## I. Basis of the report

## 1. With regard to the elements of the international application:\*

the international application as originally filed  
 the description:

pages \_\_\_\_\_, as originally filed  
 pages \_\_\_\_\_, filed with the demand  
 pages \_\_\_\_\_, filed with the letter of \_\_\_\_\_

the claims:

pages \_\_\_\_\_, as originally filed  
 pages \_\_\_\_\_, as amended (together with any statement under Article 19  
 pages \_\_\_\_\_, filed with the demand  
 pages \_\_\_\_\_, filed with the letter of \_\_\_\_\_

the drawings:

pages \_\_\_\_\_, as originally filed  
 pages \_\_\_\_\_, filed with the demand  
 pages \_\_\_\_\_, filed with the letter of \_\_\_\_\_

the sequence listing part of the description:

pages \_\_\_\_\_, as originally filed  
 pages \_\_\_\_\_, filed with the demand  
 pages \_\_\_\_\_, filed with the letter of \_\_\_\_\_

## 2. With regard to the language, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item. These elements were available or furnished to this Authority in the following language \_\_\_\_\_ which is:

the language of a translation furnished for the purposes of international search (under Rule 23.1(b)).  
 the language of publication of the international application (under Rule 48.3(b)).  
 the language of the translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

## 3. With regard to any nucleotide and/or amino acid sequence disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

contained in the international application in written form.  
 filed together with the international application in computer readable form.  
 furnished subsequently to this Authority in written form.  
 furnished subsequently to this Authority in computer readable form.  
 The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.  
 The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4.  The amendments have resulted in the cancellation of:

the description, pages \_\_\_\_\_  
 the claims, Nos. \_\_\_\_\_  
 the drawings, sheets/fig. \_\_\_\_\_

5.  This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).\*\*

\* Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rule 70.16 and 70.17).

\*\* Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.

## INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.  
PCT/JP03/11048

## V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

## 1. Statement

|                               |        |     |
|-------------------------------|--------|-----|
| Novelty (N)                   | Claims | YES |
|                               | Claims | 1-7 |
| Inventive step (IS)           | Claims | YES |
|                               | Claims | 1-7 |
| Industrial applicability (IA) | Claims | YES |
|                               | Claims | NO  |

## 2. Citations and explanations

## Documents

1. Yoshiaki SUZUKI et al., "Ion Beam to Hyomen Hyoso Kaimen no Kakawari XI Ion Beam Shosha Shita ePTFE no Jinko Komaku eno Oyo," Ionics, Vol. 27, No. 7, pp. 3-11, 2001
2. Yoshiaki SUZUKI et al., "Ion Beam to Hyomen Hyoso Kaimen no Kakawari IX Kobunshi Zairyō eno Ion Beam Shosha to Jinko Komaku eno Oyo," Ionics, Vol. 25, No. 6, (separate volume), pages 45 to 54, 1999
3. Masayoshi IZUMIKAWA, et al., "Tanso Fu-Ion Chunyu ni yori Kaishitsu Shita Seibunkaisei Poly Nyusan Hyomen no Shinkei Saibo Setchaku Tokusei," Shinku, Ionics, Vol. 45, No. 6, pp. 514-518, June 20, 2002
4. JP 5-208042 A (Ajinomoto Co., Inc.) August 20, 1993
5. US 5152783 A (Sony Corporation) October 6, 1992
6. US 5308704 A (Sony Corporation) May 3, 1994
7. US 6051751 A (Spire Corporation) April 18, 2000

## Commentary

•Based on the descriptions in documents 1, 2, and 3, the inventions of claims 1-6 lack novelty and an inventive step.

Documents 1 and 2 describe an artificial dura mater in which the surface was modified by irradiation with an ion beam at a dose of  $1 \times 10^{12}$  to  $1 \times 10^{16}$  ions/cm<sup>2</sup>.

Document 3 (Abstract) describes a polymer material comprising polylactic acid in which the surface was modified by irradiation with an ion beam at a dose of  $1 \times 10^{14}$  to  $1 \times 10^{16}$  ions/cm<sup>2</sup>. In addition, document 3 (page 1, left column, lines 1 to 6) states that the polymer material comprising polylactic acid is used as a suture thread, reinforcing material for fractures, and as a guide tube for deficient nerves.

In addition, this examination finds no differences between the polymer material of claims 1-6 and the materials described in documents 1-3.

Furthermore, because it is conventional practice in this field of technology to use a biological tissue adhesive such as fibrin glue for the attachment of dura mater, protection of sutures, etc. (for example, see document 4, Par. No. 0013), although it is not clearly disclosed in documents 1-3, this examination finds that it is obvious to persons skilled in the art to be able to use the polymer materials described in documents 1-3 in combination with a biological tissue adhesive.

As a result, even when we take the fact that they are used together with a biological tissue adhesive into consideration, the inventions of claims 1-6 and the inventions described in documents 1-3 are indistinguishable.

(Continued)

**INTERNATIONAL PRELIMINARY EXAMINATION REPORT**

International application No.

**PCT/JP03/11048****VI. Certain documents cited****1. Certain published documents (Rule 70.10)**

| Application No.<br>Patent No. | Publication date<br>(day/month/year) | Filing date<br>(day/month/year) | Priority date (valid claim)<br>(day/month/year) |
|-------------------------------|--------------------------------------|---------------------------------|---|
| EP 1252902 A1 (EX)            | 30.10.2002                           | 18.04.2002                      | 23.04.2001                                      |

**2. Non-written disclosures (Rule 70.9)**

| Kind of non-written disclosure | Date of non-written disclosure<br>(day/month/year) | Date of written disclosure<br>referring to non-written disclosure<br>(day/month/year) |
|--------------------------------|--|---|
|                                |  |   |

**VIII. Certain observations on the international application**

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

The expression "biological tissue adhesive" in the description of claim 1 on page 7 of the Specification includes adhesives other than fibrin glue such as cyanoacrylate instantaneous bonding agents, etc., and the expression "polymer material" in the description of claim 1 on page 5 of the Specification includes polymer materials other than ePTFE such as silicone, etc.

However, the Examples specifically support the enhanced affinity of the biological tissue adhesive caused by ion bombardment modification only for the combination of fibrin glue and ePTFE. After reviewing the entire text of the Specification, this examination finds that an enhanced affinity of the biological tissue adhesive caused by ion bombardment modification of the surface of a polymer material for combinations other than fibrin glue and ePTFE is not supported, nor is this matter obvious to persons skilled in the art.

As a result, the inventions of claims 1-7 lack full disclosure in the sense of PCT Article 5 and lack support by disclosure in the Specification in the sense of PCT Article 6.

**Supplemental Box**

(To be used when the space in any of the preceding boxes is not sufficient)

**Continuation of Box V:**

- Based on the description in document 5, the inventions of claims 1, 2, and 4-6 lack novelty and an inventive step.

Document 5 (Claims 1 and 12) describes an anti-thrombus material comprising silicone in which the surface has been modified by ion injection at a dose of  $1 \times 10^{12}$  to  $1 \times 10^{17}$  ions/cm<sup>2</sup>. In addition, document 5 (column 1, lines 6 to 9) states that the aforementioned anti-thrombus material is used as an artificial biomaterial for artificial blood vessels, etc.

Furthermore, this examination finds no differences between the polymer material of claims 1, 2 and 4-6 and the material described in document 5.

- Based on the description in document 6, the inventions of claims 1, 2, 4, and 6 lack novelty and an inventive step.

Document 6 (Claims 1-10) describes a cellular adhesive material comprising a polymer that contains as its constitutive element carbon such as dimethyl polysiloxane, etc., in which the surface has been modified by ion injection at a dose of  $1 \times 10^{15}$  to  $1 \times 10^{18}$  ions/cm<sup>2</sup>.

Furthermore, this examination finds no differences between the polymer material of claims 1, 2, 4, and 6 and the material described in document 6.

- Based on the description in document 7, the inventions of 1, 4, 6 and 7 lack novelty and an inventive step.

Document 7 (column 1, lines 43 to 59; column 4, lines 2 to 13; Claims 1 and 6-8) describes enhancing the adhesiveness between a high molecular weight polyene and alkyl polyacrylate by performing ion beam irradiation at a dose of  $1 \times 10^{13}$  to  $1 \times 10^{17}$  ions/cm<sup>2</sup> to the surface of an artificial biological transplant comprising a high molecular weight polyene.

- Based on the descriptions in documents 1-7, the inventions of claims 1-7 lack an inventive step.

Documents 1-3, 5, and 6 describe the modification of the surfaces of various polymer biomaterials by ion beam irradiation.

Document 7 describes the enhancement of adhesiveness to a high molecular weight polyene adhesive by ion beam irradiation.

Thus, persons skilled in the art can easily anticipate and verify that the adhesiveness of the various polymer biomaterials described in documents 1-3, 5, and 6 to adhesives will be enhanced by modifying their surfaces with ion beam irradiation.

In addition, persons skilled in the art can easily anticipate and verify that the adhesiveness of widely known biological tissue adhesives such as fibrin glue to polymer biomaterials will similarly be enhanced just as in the case of the alkyl polyacrylate adhesive described in document 7.

- The inventions of claims 1-7 have industrial applicability.